Midterm 1 Review Answer Key

1. Aluminum is a lightweight metal (density = 2.70 g/cm$^3$) used in aircraft construction, high-voltage transmission lines, and foils. What is its density in kg/m$^3$?

Conversion factors needed:
1 kg = 10$^3$ g or 10$^{-3}$ kg = 1 g
1 m = 10$^2$ cm or 10$^{-2}$ m = 1 cm → cube both sides of the equation → 1 m$^3$ = 10$^6$ cm$^3$
or 10$^{-6}$ m$^3$ = 1 cm$^3$

\[
\frac{2.70 \text{ g}}{\text{cm}^3} \times \frac{1 \text{ kg}}{1000 \text{ g}} \times \frac{(100)^3 \text{ cm}^3}{1 \text{ m}^3} = 2.70 \times 10^3 \text{ kg/m}^3
\]

Tip: to cancel units, write the conversion factor such that the units you want cancelled are diagonal to each other (e.g. as shown above, we want to convert g to kg so we write the conversion factor as kg / g)

b. The diameter of a hydrogen atom is 212 pm. Find the length in kilometers of a row of 6.02 x 10$^{23}$ hydrogen atoms.

In general, start with what’s given (6.02 x 10$^{23}$ atoms) and use conversion factors to cancel units at each step until the desired units are obtained. Be on the lookout for conversion factors that are indirectly given to you in the problem (1 hydrogen atom = 212 pm).

\[
6.02 \times 10^{23} \text{ H atoms} \times \frac{212 \text{ pm}}{1 \text{ H atom}} \times \frac{1 \text{ m}}{10^{12} \text{ pm}} \times \frac{1 \text{ km}}{1000 \text{ m}} = 1.28 \times 10^{11} \text{ km}
\]

c. A silver (Ag) object weighing 194.3 g is placed in a graduated cylinder containing 242.0 mL of water. The volume of water now reads 260.5 mL. From these data calculate the density of silver in g/cm$^3$.

Notice that the volume of the object is the volume of water when the object is submerged MINUS the initial volume of water: 260.5 mL – 242.0 mL = 18.5 mL.

\[
d = \frac{m}{V} = \frac{194.3 \text{ g}}{18.5 \text{ mL}} = 10.5 \text{ g/mL}
\]

Recall 1 mL = 1 cm$^3$. Therefore, d = 10.5 g/cm$^3$. 
2. Fill in the blanks in this table:

<table>
<thead>
<tr>
<th>Symbol</th>
<th>$^{11}_{5}$B</th>
<th>$^{54}_{26}$Fe$^{2+}$</th>
<th>$^{31}_{15}$P$^{3-}$</th>
<th>$^{196}_{79}$Au</th>
<th>$^{222}_{86}$Rn</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protons</td>
<td>5</td>
<td>26</td>
<td>15</td>
<td>79</td>
<td>86</td>
</tr>
<tr>
<td>Neutrons</td>
<td>6</td>
<td>28</td>
<td>16</td>
<td>117</td>
<td>136</td>
</tr>
<tr>
<td>Electrons</td>
<td>5</td>
<td>24</td>
<td>18</td>
<td>79</td>
<td>86</td>
</tr>
<tr>
<td>Net Charge</td>
<td>0</td>
<td>2+</td>
<td>3–</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Isotopic Notation: $^{A}_{Z}$X
- A: mass number = # protons + # neutrons
- Z: atomic number aka # protons (usually omitted as it is understood, provided X is known)
- X: element symbol
- May include charge if it’s also an ion (isotopes can also be ions)

1. We are given $Z = 5$, so we the identity of the atom, X, is B. Since $#p^+ = #e^-$, this is a neutral atom, i.e. net charge = 0.

2. We are directly given $A = 54$, $Z = 26$, $X = Fe$, and net charge = 2+.

   $$A = #p^+ + #n \rightarrow 54 = 26 + #n \rightarrow #n = 28$$

   The species is a 2+ cation, meaning it lost 2 electrons to acquire a 2+ charge. (Recall: ca[+]ions are formed when a neutral atom loses an e− thereby gaining a net [+] charge). In a neutral Fe atom, $#p^+ = #e^- = 26$. To become the 2+ cation, 2 e− are lost, $26 - 2 = 24$ e

3. In a neutral atom, $#p^+ = #e^-$. The species is a 3− anion, meaning it gained 3 electrons to acquire a 3− charge. (Recall: anions are formed when a neutral atom gains an e− thereby gaining a net [−] charge). It is given that the 3− anion form has 18 e−, so the # e− (and # p+) in the neutral atom is 3 e− fewer, i.e. $18 - 3 = 15$. The identity of the atom is thus P.

4. Since the $#p^+ = #e^- = 79$, the net charge is 0.

5. Since the net charge is 0, the $#p^+ = #e^- = 86$.

3. In light of the nuclear model of the atom, which statement is true?
   (A) For a given element, the size of an isotope with more neutrons is larger than one with fewer neutrons.
   (B) For a given element, the size of an atom is the same for all of the element’s isotopes.

   B is true. Isotopes are forms of an atom with differing numbers of neutrons (but same number of protons!) in the nucleus and therefore mass numbers. Recall that the atom is mostly empty space: the nucleus (a dense core) is composed of protons and neutrons packed tightly together, and is surrounded by the fairly vast electron cloud. In short, protons and neutrons have most of the mass but occupy very little of the volume of the atom. Because the nucleus is miniscule compared to the atom itself, the number of neutrons in the nucleus of an atom does not affect the atom’s size. Therefore, an element’s isotopes are roughly the same size, but its ions are not.
4. An element has two naturally occurring isotopes. Isotope 1 has a mass of 120.9038 amu and a relative abundance of 57.4%, and isotope 2 has a mass of 122.9042 amu. Find the atomic mass of this element and identify it. Do any atoms of this element actually have this mass?

Atomic mass = Σ (fractional abundance × mass of isotope) where mass can be in units of either g/mol or amu

Since there are only two isotopes, the relative abundance of the second isotope is 100% – 57.4% = 42.6%.

Atomic mass = (120.9038 amu × 0.574) + (122.9042 amu × 0.426) = 122 amu

The identity of the element is Sb.

The atomic mass we have just calculated (aka the one listed on the periodic table) is an average value, so no Sb atoms actually have this mass.

5. The average atomic mass of an element is known to be 32.064 amu. Determine the fractional abundance of the isotopes whose fractions are not displayed in the table.

<table>
<thead>
<tr>
<th>Fraction</th>
<th>Atomic Mass (amu)</th>
</tr>
</thead>
<tbody>
<tr>
<td>?</td>
<td>31.972</td>
</tr>
<tr>
<td>0.008</td>
<td>32.971</td>
</tr>
<tr>
<td>?</td>
<td>33.968</td>
</tr>
</tbody>
</table>

Atomic mass = Σ (fractional abundance × mass of isotope)

Let x, y, and z denote the fractional abundance of isotopes 1, 2, and 3, respectively:

\[ x + y + z = 1 \]

But we are given y = 0.008. Therefore, we can write

\[ x + 0.008 + z = 1 \]

which simplifies to

\[ x + z = 0.992 \]

Plug into the equation:

\[ 32.064 \text{ amu} = (31.972 \text{ amu} \times x) + (32.971 \text{ amu} \times 0.008) + (33.968 \text{ amu} \times z) \]
We have two unknowns, $x$ and $z$. But we can re-write $x + z = 0.992$ as $z = 0.992 - x$ (or $x = 0.992 - z$). The equation therefore becomes:

$$32.064 = (31.972 \times x) + (32.971 \times 0.008) + (33.968 \times [0.992 - x])$$

$$32.064 = 31.972x + 0.263768 + 33.696256 - 33.968x$$

$$-1.896024 = -1.996x$$

$$x = 0.950$$

$$z = 0.992 - x = 0.992 - 0.950 = 0.042$$

6. a. Which of the following has a greater mass: 2 atoms of lead or $5.1 \times 10^{-23}$ mole of helium?

$$2 \text{ atoms Pb} \times \frac{1 \text{ mol Pb}}{6.022 \times 10^{23} \text{ atoms Pb}} \times \frac{207.2 \text{ g Pb}}{1 \text{ mol Pb}} = 6.881 \times 10^{-22} \text{ g Pb}$$

$$5.1 \times 10^{-23} \text{ mol He} \times \frac{4.008 \text{ g He}}{1 \text{ mol He}} = 2.0 \times 10^{-22} \text{ g He}$$

**2 atoms of lead have a greater mass.**

b. How many carbon atoms are there in a diamond (pure carbon) with a mass of 52 mg?

Approach: $\text{mg C} \rightarrow \text{g C} \rightarrow \text{mol C} [\text{using molar mass}] \rightarrow \text{atoms C} [\text{using Avogadro’s number}]$

$$52 \text{ mg C} \times \frac{1 \text{ g C}}{1000 \text{ mg}} \times \frac{1 \text{ mol C}}{12.01 \text{ g C}} \times \frac{6.022 \times 10^{23} \text{ atoms}}{1 \text{ mol C}} = 2.6 \times 10^{21} \text{ C atoms}$$

c. Only one isotope of this element occurs in nature. One atom of this isotope has a mass of $9.123 \times 10^{-23}$ g. Identify the element.

We can use molar mass, which has units in g/mol, to identify an element. We are given that $9.123 \times 10^{-23}$ g is the mass of 1 atom. In other words, convert g/atom to g/mol.

$$\frac{9.123 \times 10^{-23} \text{ g}}{1 \text{ atom}} \times \frac{6.022 \times 10^{23} \text{ atoms}}{1 \text{ mol}} = 54.94 \text{ g/mol}$$

The identity of the element is **Mn**.

7. Which of the following statements is (are) true?
I. The product of wavelength and frequency of light is a constant.
II. As the energy of electromagnetic radiation increases, its frequency decreases.
III. As the wavelength of light increases, its frequency increases.

I is true as it is a statement of \( c = \nu \lambda \).

II is false. This statement can be corrected in two ways. From \( E = h\nu \) we see that energy and frequency are directly related, so as the energy of electromagnetic radiation increases, its frequency must also increase and vice-versa. From \( E = (hc) / \lambda \) we see that energy and wavelength are indirectly related, so as the energy of electromagnetic radiation increases, its wavelength decreases and vice-versa.

III is false. Since \( \nu \lambda = c \) where \( c \) is the speed of light (a constant), an increase in wavelength must be accompanied by a decrease in frequency and vice-versa. If it helps, re-arrange the equation to \( \lambda = c / \nu \) and notice the inverse relationship between wavelength and frequency.

8. A photon has a frequency of 6.0 \( \times \) 10\(^{14} \) Hz.
   a. Convert this frequency into wavelength (nm). Does this frequency fall in the visible region?
      Use \( c = \nu \lambda \). Then convert m to nm.
      \[
      3.00 \times 10^8 \frac{m}{s} = \lambda \times 6.0 \times 10^{14} \text{ Hz}
      \]
      \[
      \lambda = 5.0 \times 10^{-7} \text{ m} \times \frac{10^9 \text{ nm}}{1 \text{ m}} = 5.0 \times 10^2 \text{ nm}
      \]
      Yes, this frequency does fall in the visible region (400-700 nm).
   b. Calculate the energy (in joules) of this photon.
      Use either \( E = h\nu \) or \( E = (hc) / \lambda \):
      \[
      E = 6.626 \times 10^{-34} \text{ J} \cdot \text{s} \times 6.0 \times 10^{14} \text{ s}^{-1} = 4.0 \times 10^{-19} \text{ J}
      \]
   c. Calculate the energy (in joules) of 1 mole of photons all with this frequency.
      Method 1: Use \( E_{\text{total}} = nh\nu \) where \( n = N_A = 6.022 \times 10^{23} \) photons.
      \[
      E = 6.022 \times 10^{23} \text{ photons} \times 6.626 \times 10^{-34} \text{ J} \cdot \text{s} \times 6.0 \times 10^{14} \text{ s}^{-1} = 2.3 \times 10^5 \text{ J}
      \]
      Method 2: Knowing the energy of 1 photon = 4.0 \( \times \) 10\(^{-19} \) J from part b, convert J/photon to J/mol.
\[
\frac{4.0 \times 10^{-19} \text{ J}}{\text{photon}} \times \frac{6.022 \times 10^{23} \text{ photons}}{1 \text{ mol}} = 2.3 \times 10^5 \text{ J}
\]

*can also use the \( \lambda \) variants of the equations above

9.

a. The retina of a human eye can detect light when radiant energy incident on it is at least \( 4.0 \times 10^{-17} \text{ J} \). For light of 600 nm wavelength, how many photons does this correspond to?

Given:
\( 4.0 \times 10^{-17} \text{ J} = \text{total energy of } n \text{ photons} \)
\( 600 \text{ nm} = \text{wavelength (\( \lambda \)) of photons} \)

Therefore, we can use \( E_{\text{total}} = (nhc) / \lambda \). Convert nm to m first in order to cancel units.

\[
600 \text{ nm} \times \frac{1 \text{ m}}{10^9 \text{ nm}} = 6.00 \times 10^{-7} \text{ m}
\]

\[
4.0 \times 10^{-17} \text{ J} = n \times \frac{6.626 \times 10^{-34} \text{ J} \cdot \text{s} \times 3.00 \times 10^8 \text{ m/s}}{6.00 \times 10^{-7} \text{ m}}
\]

\[
n = 120 \text{ photons}
\]

b. Calculate the total energy of a beam of photons with wavelength 438 nm composed of \( 7.86 \times 10^{-9} \text{ mol photons} \).

\( E_{\text{total}} = nhv \) approach:

A few conversions to make first…
- mol \( \rightarrow \) photons to obtain \( n \)
\( 7.86 \times 10^{-9} \text{ mol photons} \times (6.022 \times 10^{23} \text{ photons} / 1 \text{ mol photons}) = 4.73 \times 10^{15} \text{ photons} \)

- wavelength \( \rightarrow \) frequency to obtain \( v \)
\( v = c / \lambda \)
\( v = 3.00 \times 10^8 \text{ m/s} / (439 \text{ nm} \times [1 \text{ m} / 10^9 \text{ nm}]) = 6.83 \times 10^{14} \text{ s}^{-1} \)

\[
E_{\text{total}} = 4.73 \times 10^{15} \text{ photons} \times 6.626 \times 10^{-34} \text{ J-s} \times 6.83 \times 10^{14} \text{ s}^{-1}
\]
\[
E_{\text{total}} = 2.14 \times 10^{-3} \text{ J}
\]

*can also use \( E_{\text{total}} = (nhc) / \lambda \).
\[ E_{\text{photon}} = \frac{(h \cdot c)}{\lambda} \text{ approach:} \]

438 nm \times \left( \frac{1 \text{ m}}{10^9 \text{ nm}} \right) = 4.38 \times 10^{-7} \text{ m}

\[ E_{\text{photon}} = \frac{(6.626 \times 10^{-34} \text{ J} \cdot \text{s} \times 3.00 \times 10^8 \text{ m/s})}{4.38 \times 10^{-7} \text{ m}} \]

\[ E_{\text{photon}} = 4.54 \times 10^{-19} \text{ J} \] (this is the energy of 1 photon but we have \(7.86 \times 10^{-9}\) mol of photons)

\[ 7.86 \times 10^{-9} \text{ mol photons} \times \left( \frac{6.022 \times 10^{23} \text{ photons}}{1 \text{ mol photons}} \right) \times \left( \frac{4.54 \times 10^{-19} \text{ J}}{1 \text{ photon}} \right) = 2.15 \times 10^{-3} \text{ J} \]

c. The binding energy of electrons in a metal is 193 kJ/mol. Find the threshold frequency of the metal.

Use \(E = h \nu\) where \(E\) is in units of J/photon. Thus, first convert kJ/mol to J/photon.

\[ \frac{193 \text{ kJ}}{1 \text{ mol}} \times \frac{1000 \text{ J}}{1 \text{ kJ}} \times \frac{1 \text{ mol}}{6.022 \times 10^{23} \text{ photons}} = 3.20 \times 10^{-19} \text{ J} \]

Then plug in the value just calculated for \(E\) into \(E = h \nu\) to obtain the frequency of the light required to dislodge the electrons from the surface of the metal.

\[ 3.20 \times 10^{-19} \text{ J} = 6.626 \times 10^{-34} \text{ J} \cdot \text{s} \cdot \nu \]

\[ \nu = 4.84 \times 10^{14} \text{ Hz} \]

10. de Broglie Equation

a. Calculate the wavelength of a proton with a kinetic energy of \(1.85 \times 10^{-20} \text{ J}\). The mass of a proton is \(1.67 \times 10^{-27} \text{ kg}\).

First use \(KE = \frac{1}{2}mv^2\) to calculate \(v\). Recall 1 J = 1 kg \(\times m^2/s^2\).

\[ 1.85 \times 10^{-20} \text{ J} = \frac{1}{2} \times 1.67 \times 10^{-27} \text{ kg} \times v^2 \]

\[ v = 4710 \text{ m/s} \]

Then use the de Broglie equation, \(\lambda = h / (mv)\), to calculate \(\lambda\):

\[ \lambda = \frac{6.626 \times 10^{-34} \text{ J} \cdot \text{s}}{1.67 \times 10^{-27} \text{ kg} \times 4710 \text{ m/s}} = 8.43 \times 10^{-11} \text{ m} \]
b. Since quantum-mechanical theory is universal, it applies to all objects, regardless of size. Therefore, according to the de Broglie relation, a thrown baseball should also exhibit wave properties. Why don’t we observe such properties at the ballpark?

Look at the de Broglie equation:

$$\lambda = \frac{h}{mv}$$

Wavelength and mass are inversely related. Because of the baseball’s large mass, its de Broglie wavelength is extremely small. (For a 150 g baseball, \(\lambda\) is on the order of \(10^{-34}\) nm). The wavelength is insignificant compared to the size of the baseball itself, and therefore its effects are not observable. (For reference, visible light is on the order of \(10^{-7}\) m). In short, objects of the macroscopic realm do not exhibit significant wavelike properties whereas those of the microscopic realm (such as electrons) do.

11. How much energy is released from a hydrogen atom when an electron moves from \(n = 4\) to \(n = 2\)?

**Answer:** Let’s use the Rydberg equation first. We know the values of \(n_f\) and \(n_i\), so we just need to plug and chug:

$$\Delta E = R_H \left( \frac{1}{n_i^2} - \frac{1}{n_f^2} \right) = 2.18 \times 10^{-18} \text{ J} \left( \frac{1}{4^2} - \frac{1}{2^2} \right) = -4.10 \times 10^{-19} \text{ J}$$

Because this equation is not given to you on the test, let’s take a look at the same problem using the equation that is provided:

$$\Delta E = E_f - E_i = E_2 - E_4$$

$$E_2 = -R_H \left( \frac{1}{n_2^2} \right) = -2.18 \times 10^{-18} \text{ J} \left( \frac{1}{2^2} \right) = -5.45 \times 10^{-19} \text{ J}$$

$$E_4 = -R_H \left( \frac{1}{n_4^2} \right) = -2.18 \times 10^{-18} \text{ J} \left( \frac{1}{4^2} \right) = -1.36 \times 10^{-19} \text{ J}$$

$$\Delta E = E_2 - E_4 = -5.45 \times 10^{-19} \text{ J} - (-1.36 \times 10^{-19} \text{ J}) = -4.09 \times 10^{-19} \text{ J}$$

(Which, considering rounding, is the same as the previous answer.)

12. A hydrogen atom with an electron in the \(n = 4\) level emits a photon with a wavelength of 873 nm. What is the value of \(n\) for the final energy level?

\[ E = \frac{hc}{\lambda} = \frac{(6.626 \times 10^{-34} \text{ J} \cdot \text{s}) \times (3.00 \times 10^8 \text{ m/s})}{(873 \times 10^{-9} \text{ m})} = 2.28 \times 10^{-19} \text{ J} \]

\[ E = -R_H \left( \frac{1}{n_f^2} - \frac{1}{n_i^2} \right) \]

\[ 2.28 \times 10^{-19} \text{ J} = -2.18 \times 10^{-19} \text{ J} \left( \frac{1}{4^2} - \frac{1}{n_f^2} \right) \]

\[ -1.044 = \left( \frac{1}{4^2} - \frac{1}{n_f^2} \right) \]

\[ -1.1 = -\frac{1}{n_f^2} \]

\[ n_f^2 = 0.9 \text{ around } 1 \]

\[ n_f = 1 \]
13. Determine if the following quantum numbers are possible or not. If possible, determine the orbital.

a) n: 3  l:2  m:-3
b) n:4  l:2  m: 0
c) n:4  l:1  m: -1
d) n:2  l:2  m: 2
e) n:1  l:0  m:0

a) not possible
b) possible 4d<sub>z</sub>
c) possible 4p<sub>x</sub>
d) not possible
e) possible 1s

When approaching these, remember that l is equal to (n-1) and m is equal to (-l to +1). If this trend does not correspond, it is not possible.

Regarding orbitals, n determines the shell of the orbital. For example, n = 2 means that the element is in the 2s or 2p orbital and has an energy level of 2. The next step would be to use the l value to determine the subshell. If l is 0, it is in the s subshell, if 1 it is in the p subshell, if 2, d subshell and if 3, f subshell.

m determines the orientation of the orbital.

14. Which element has the outermost electrons that would be described by these quantum numbers (4,0,0)?

n = 4 so shell is 4
l = 0 so subshell is s
m<sub>l</sub> = 0 which confirms it is a subshell of s

So, the element can be K or Ca (both in 4s region of periodic table)

Why not one or the other?
s is sphere so there is no specific orientation (or rather, there is only one way to orient a sphere onto an x-y-z plane)

15. Choose the correct orbital diagram for vanadium. (V)
(d). Write the ground-state electron configuration for V (Z = 23): [Ar] 4s\(^2\) 3d\(^3\).

However, also notice…
Only (d) adheres to the Aufbau principle, Pauli exclusion principle, and Hund’s rule – the 4s orbital was filled before the 3d orbitals, no two electrons have the same four quantum numbers & each orbital holds a maximum of two electrons, degenerate orbitals were half-filled before pairing
(a) violates Hund’s rule – electrons must first fill degenerate orbitals singly with parallel spins before pairing in the 3d orbitals
(b) violates the Aufbau principle – electrons fill orbitals in order from lowest to highest energy (4s is slightly lower in energy than 3d)
(c) violates the Aufbau principle and Hund’s rule – electron pairing should have occurred in the 4s orbital, which is lower in energy, before occupying the 3d orbitals

16.
(A) 1s\(^2\)2s\(^2\)2p\(^1\)
(B) 1s\(^2\)2p\(^1\)
(C) 1s\(^2\)2s\(^2\)2p\(^6\)3s\(^2\)
(D) 1s\(^2\)2s\(^2\)2p\(^7\)3s\(^1\)
(E) 1s\(^2\)2s\(^2\)2p\(^6\)

1. Corresponds to a noble gas
2. Represents an impossible configuration
3. Ground state configuration for Mg
4. Represents an atom in an excited state

In case you were trying to answer these, the answers are:
1. (E)
2. (D)
3. (C)
4. (B)
17. Which set of quantum numbers \((n, l, m_l, m_s)\) is NOT possible?
(A) 1, 0, 0, ½
(B) 1, 1, 0, ½
(C) 1, 0, 0, -½
(D) 2, 1, -1, ½
(E) 3, 2, 1, ½

B

\(n = \) any positive whole number
\(l = n-1\)
\(m_l = -l \) to +\(l\)
\(m_s = +\frac{1}{2} \) or -\(\frac{1}{2}\)

B breaks this as \(l\) is not equal to \(n-1\)

18. Which one of the following electron configurations for the species in their ground state is NOT correct?
(A) Ca: 1s\(^2\)2s\(^2\)2p\(^6\)3s\(^2\)3p\(^6\)4s\(^2\)
(B) Bi: [Xe]6s\(^2\)4f\(^{14}\)5d\(^{10}\)6p\(^3\)
(C) As: [Ar] 4s\(^2\)3d\(^{10}\)4p\(^3\)
(D) Br: [Ar] 4s\(^2\)3d\(^{10}\)4p\(^5\)
(E) P: 1s\(^2\)2s\(^2\)2p\(^6\)3p\(^3\)

E

P is 1s\(^2\)2s\(^2\)2p\(^6\)3p\(^3\)

Look at the periodic table for each and create your own electron configuration and compare.

19. What is a radial node? If the quantum number is 5, how many radial nodes are there?

\(n-1 = \) radial nodes
5-1 = 4 radial nodes

20. Identify the period and group of the element.

Zirconium

Tellurian

Basically, empty space between axial nodes
Zirconium is in period 5 and is the 2nd element in the d-transition element group.
Zr: 1s\(^2\)2s\(^2\)2p\(^6\)3s\(^2\)3p\(^6\)4s\(^2\)3d\(^{10}\)4p\(^6\)5s\(^2\)4d\(^2\) or [Kr]5s\(^2\)4d\(^2\)

Tellurium is in period 5 and is the 4th element in the p-group.
Te: 1s\(^2\)2s\(^2\)2p\(^6\)3s\(^2\)3p\(^6\)4s\(^2\)3d\(^{10}\)4p\(^6\)5s\(^2\)4d\(^{10}\)5p\(^4\) or [Kr]5s\(^2\)4d\(^{10}\)5p\(^4\)

Additional Notes:
- “Read” the periodic table to obtain an element’s quantum numbers and electron configurations. Understand the logic of how the periodic table is set-up.

- Periodic Trends Kahoot: [https://create.kahoot.it/share/chem-1a-periodic-trends-extra-practice/b8e6760e-9977-4c63-a4fd-699d9f173e15](https://create.kahoot.it/share/chem-1a-periodic-trends-extra-practice/b8e6760e-9977-4c63-a4fd-699d9f173e15)
  - Play with your study group or use it to test yourself!
- Suggestions for studying for the midterm:
  - Briefly review lecture slides, focusing on working through the problems
  - Refer back to the textbook/online for any concepts that are unclear
  - Re-do online homework problems you got wrong/are still confused about
  - Do the self-assessment quiz at the end of each chapter in the textbook (GREAT multiple-choice questions)
  - Do as many practice problems from the textbook as possible such as the odd-numbered exercises at the end of each chapter, exercises within the chapters (these have more detailed explanations), conceptual connection questions
  - Peer tutoring worksheets are also available for extra practice

*Good luck on the midterm! We believe in all of you!*